NUTRITION KNOWLEDGE, BEHAVIORS, AND BODY WEIGHT CORRELATIONS OF YOUNG ADULTS WITH INTELLECTUAL DISABILITIES BEFORE AND AFTER A COMMUNITY-BASED INTERVENTION

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ABSTRACT

Young adults with intellectual disabilities have a higher risk of obesity compared with the general population. This analysis used a subset of data from the study, Yes We Can: An Overweight Reduction and Healthy Lifestyle Improvement Program for Young Adults with Intellectual Disabilities. Young adults with intellectual disabilities aged 18-35 completed a 12 week intervention as participants (n=11) or acted as controls (n=11). Body weight, nutrition knowledge, and attitudes toward healthy eating were assessed at pre- and postintervention for both groups. Baseline quantitative and dichotomous variables tested with chi-squared and independent samples *t*-tests were not significantly different. After the 3 month program, paired samples *t*-test and analysis of variance indicated that neither group showed significant improvements in the total scores for the nutrition knowledge and attitude surveys. However, participants in the intervention increased their social and environmental supports for nutrition ($p < 0.05$), as compared to controls ($p = .208$). These results suggest that the education portion of the intervention was unable to increase nutrition knowledge or attitudes significantly, though it did help participants find new sources of support for a healthy lifestyle. In conclusion, other methods or curriculum may need to be used in this population for nutrition education.

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INTRODUCTION

Background/Literature Review

Intellectual disability (ID), formerly known as mental retardation, is characterized by a significantly below-average score on a mental ability or intelligence test and limitations in ability to function in certain areas of daily life, such as communication, self-care, and social/interpersonal skills (1). Degrees of ID include mild, moderate, severe, and profound which are defined by intelligence quotient (IQ) (2). The President's Committee for People with Intellectual Disabilities estimates that there are seven to eight million Americans of all ages who experience intellectual disabilities (3). Furthermore, ID impacts approximately 1 in 10 families in the U.S. (3).

The prevalence of obesity in young adults with intellectual disabilities is higher than in the general population (2, 4-10). Studies indicate that many factors play a role in developing or exacerbating obesity in the ID community. Diminished muscle tone and behavioral feeding issues predispose persons with ID to weight gain (8). In addition, the majority of adults with ID lead physically inactive lifestyles (2, 4, 11-14). Specifically, Robertson et al. reported that 84% of men and 88% of women with ID were classified as inactive compared to 50.3% of men and 53.5% of women in the general population (11-12). Another important contributor to obesity is nutritional status and dietary intake (2, 15). For example, consistent nutritional status impairment can result in reduction of fat free mass and bone mineral content. Bertoli et al. reported lower levels of these measures

in ID participants than nondisabled controls (15). In the same study, the distribution of fatty acid intake in ID participants did not meet the recommended ratios (15). Saturated fats were consumed three times more often than polyunsaturated fatty acids in the ID subjects compared to controls. Excessive consumption of simple carbohydrates and insufficient intake of fiber, iron, calcium, potassium, and zinc were also found in the ID participants (15). An additional potential risk factor for obesity in this population is the use of medications for treatment of their disability, with side effects that may affect body weight, blood glucose, and lipids (16).

Researchers suggest methods to encourage individuals with ID to improve nutrition knowledge and increase levels of physical activity (2, 17-20). Illingworth et al recommends the use of appropriate pictures, clear language, and fewer questions when evaluating nutrition knowledge in this population (17). Using these tools for assessment, an education program could be created. Furthermore, Fishbein and Ajzen suggest that knowledge, such as the relationship between energy intake and expenditure, is a prerequisite for behavioral change (18). These examples of established theory and research on education and behavior change in the ID population suggest a nutrition and exercise program can be designed to meet these needs, as well as address potential barriers these individuals experience in maintaining a healthy weight.

Significance of Problem

ID affects approximately 10% of American families (3), which translates into a high number of individuals that need specialized care for the prevention of obesity and associated co-morbidities. The increased prevalence of childhood obesity in non-

disabled children is also observed in youth with ID. Stewart and colleagues reported that adolescents with mild to moderate cases of ID are at increased risk of obesity. This finding presents a significant challenge as obesity in youth is shown to transcend into adulthood (5). In addition, obesity in childhood can lead to health problems at a younger age than the general population, such as diabetes mellitus type 2 and cardiovascular disease (21). Type 2 diabetes is associated with the following co-morbidities: renal failure, blindness, arterial disease, and impaired wound healing. Cardiovascular disease is also more prevalent in the ID population (15, 22-23). Bertoli and colleagues reported that poor nutritional status in disabled patients is related to a large amount of fat mass and a number of biochemical risk factors for cardiovascular disease (15). Furthermore, another study found that individuals with mild to moderate ID are at an elevated risk for cardiovascular disease (CVD)-related mortality, with associated physiological CVD risk factors such as elevated cholesterol levels and high blood pressure (23).

Sohler and colleagues aimed to develop new strategies to lessen chronic disease risk factors in the ID population (22). Subject characteristics revealed high rates of obesity (43%), hypertension (19.9%), hypercholesterolemia (26.5%), and diabetes mellitus (4.5%). These findings further illustrate the significance of the overweight and obesity problem for individuals with ID, and the need for nutrition and physical activity programs in this population.

There is a lack of research-based programs that focus on lifestyle behaviors for individuals with ID. In particular, interventions are needed that engage families, address both diet and physical activity and associated barriers, and provide individualized

recommendations to regional and cultural issues (2, 19, 22-23). Previously, research has addressed only one of these variables at a time, without developing a comprehensive program for this high-risk population.

Purpose/Hypotheses of Research

The data for this analysis are a subset of data from the study, Yes We Can: An Overweight Reduction and Healthy Lifestyle Improvement Program for Young Adults with Intellectual Disabilities. The investigators for this pilot study include Lauren Clark, RN, PhD, FAAN; Marge Pett, MStat, DSW; Cathy Chambless, PhD; Elizabeth Cardell, MS, OTR/L; Erin Rothwell, PhD, TRS, CTRS, CRSS; and Susan L. Johnson, PhD. The intervention is funded by the University of Utah Research Foundation Seed Grant. The purpose of this larger study is to form a community partnership to pilot test the implementation of the Yes We Can! program to achieve healthy lifestyles.

Using the nutrition related data from this program, we hypothesized that participation in Yes We Can! will increase nutrition knowledge, improve attitudes towards fruits and vegetables, reveal an inverse relationship between changes in anthropometric and nutrition survey data, and increase motivation for weight loss.

METHODS

Research Design

The Yes We Can study enrolled a convenience sample of overweight young adults (n=23) with mild to moderate ID. The intervention consisted of a 12-week curriculum based on health education and physical activity. Participants were randomly allocated into two cohorts. Each cohort contained 11-12 subjects, with support from family members and a companion program for individuals with ID called Best Buddies. Cohort 1 was evaluated at baseline (January 2010), postintervention (April 2010), and at the 3 month follow-up (June 2010). Cohort 2 was also evaluated at baseline (January 2010), preintervention (April 2010), postintervention (June 2010), and at the 3 month follow-up (September 2010). A follow-up session occurred 3 months after the intervention to assess sustainability of the pilot program results.

Study measures included demographic information, medical and health history, nutritional knowledge surveys (26), psychosocial health questionnaires (26), and physical activity surveys (26). Also, assessments of body weight, height, waist/hip circumference, and various muscular strength, endurance, flexibility, functional status and balance tests were administered at pre- and postintervention periods.

Subject Selection Criteria

Study eligibility criteria included the following: young adults ages 18-35 with mild to moderate ID (27), body mass index (BMI) between 25-54 kg/m², ability to speak English, capability to feed by mouth, and living at home. Exclusion criteria consisted of significant health concerns including functional or structural gastrointestinal problems, pregnancy, lactation, and cardiovascular event or cancer diagnosis in the last 12 months, disordered eating (e.g., Prader-Willi, compulsive eating), severe psychiatric conditions that would prevent participation (e.g., combative behaviors); and other structural or functional conditions precluding moderate exercise. Subjects were recruited by word of mouth in the community and through a combination of networking and electronic announcements sent through the active and waitlisted rolls of the Division of Services for People with Disabilities, Best Buddies, Utah Parent Center, Utah Down Syndrome Foundation Listserv, Splore, National Ability Center, Special Olympics, Camp Kostopulous, Jordan School District, University of Utah College of Nursing faculty, and contact with the leaders of the LDS Special Needs Mutual in Sandy, Utah.

Prior to enrollment, the Yes We Can! co-investigators screened prospective research subjects for eligibility using the inclusion and exclusion criteria for the study. A healthcare provider release was required and consent and assent forms were obtained for all parents and young adult participants. The Yes We Can! research team obtained protocol approval from the Institutional Review Board of the University of Utah and the Utah Department of Human Services prior to study initiation. As compensation for participation, the research study team purchased from Salt Lake County Parks and

Recreation annual passes to all Salt Lake County recreation facilities for both the participating young adult and one caregiver.

Data Collection

Demographics

Demographic data were analyzed at baseline to compare similarities between the cohorts. Demographic surveys ask parents to report the following information for their young adult participant: age, gender, race, level of intellectual disability, socioeconomic status, educational level and employment status for both parent and participant, primary support person, type of residence, income level and marital status of parent, and eating habits of the family.

Anthropometrics

Body weight was determined with participants in light clothing via a calibrated digital scale (Model Taylor Glass Electronic Scale, Taylor Precision Products, Oak Brook, IL) to the nearest 0.1 lb**.** Height was assessed with a stadiometer (Portable Adult/Infant Measuring Unit, Perspective Enterprises, Portage, MI) to the nearest 0.1 inch. Height and weight data were converted to metric units to calculate BMI. Waist and hip circumference were determined using a non-stretchable measuring tape to the nearest 0.1 inch. All assessments were conducted by the same research assistant each time.

Nutrition and Activity Knowledge (NAKS*)*

This questionnaire consists of 18 items that assess nutrition and physical activity knowledge. If the survey could not be completed by the young adult, a parent or research assistant aided in helping with reading and comprehension. Surveys were completed in hard copy format at intake, and then transitioned to a web-based process using a computer. Participants could complete the survey at home on their own computer or at the time of subsequent data collection using a computer at the recreation center where other data collection activities were taking place. The survey is adopted from the Exercise and Nutrition Health Education Curriculum for Adults with Developmental Disabilities (26). Reliability and validity of the NAKS survey was previously demonstrated via content validity (17,28) and internal consistency reliability, with a Cronbach's Alpha of 0.86 and 0.75 for the weight control and nutrition subscales, respectively. The NAKS questions included a series of cartoon pictures in which the participant circled the item thought to be correct. A correct answer received one point; incorrect answers scored no points.

Nutrition Outcome Expectations

The Nutrition Outcome Expectations survey includes 27 items that inquire about behaviors toward fruit and vegetable intake, barriers to nutrition, and associated social/environmental supports. This survey is derived from the Exercise and Nutrition Health Education Curriculum for Adults with Developmental Disabilities (26). The completed documents were used to assess the attitudes of the young adults toward eating healthfully and the barriers and support received in relation to healthy living.

Specifically, ten questions address the attitudes of the subjects toward fruit and vegetable intake and consumption. Thirteen questions relate to barriers the participants might encounter in eating healthy and in food preparation. The last four questions ask the subject to identify social or environmental support for eating healthfully. This survey was completed by the young adults, with assistance as needed by parents or researchers. The participants received two points in this survey for a positive response to fruit and vegetable intake, one point for a negative response, and zero points for the both or neither option. Thus an increase in the score would show a trend toward more positive attitudes towards fruits and vegetables. Validity and reliability of the survey were established as evidenced by Rasch Analysis Pearson Reliability score of 0.73 and a Cronbach's Alpha of 0.93 (29).

Group and Individual Weight Loss Tracker

Graphs tracking weight loss were updated on a regular basis during the intervention period. The x-axis was marked with each class date for the length of the study; the y-axis labeled with the amount of weight loss in pounds since baseline. One graph was placed in a central area in the classroom; the tracker contained all the data and was available for view by both participants and parents. Also, each young adult received a personalized graph tracker in a binder from the researchers. Upon program completion, a five item evaluation form assessed the importance of both the group and individual weight loss trackers to the participant.

Intervention

The intervention consisted of two lessons a week with 90 minutes allocated for each session. The lessons included two parts, beginning with 30 minutes of health education followed by 60 minutes of physical activity in the weight room. At the end of each class, the investigators and research assistants evaluated each session and discussed ideas for program improvement.

The health education portion followed the curriculum in the manual "Exercise and Nutrition Health Education Curriculum for Adults with Developmental Disabilities" (26). This curriculum is a previously tested, flexible interactive program developed specifically for persons with ID, with intervention components and corresponding outcomes measures derived from two theoretical frameworks: Bandura's social cognitive theory of social learning (30) and the Transtheoretical Model of Behavior Change (31). The lessons were administered by two Salt Lake County recreation staff members with bachelor's degrees in recreation therapy. Each young adult received a binder with worksheets and instructional pages from the curriculum that was completed in class. The binder also contained a form that tracked current weight machine levels for the strength training portion of class, as well as another log that documented current body weight, and the mood and pain levels of the participants for each class.

As part of classroom time, participants viewed weight loss progress though personal tracking charts as well as a group poster showing each individual as a separate color. These graphs provided each individual with personalized data to keep in the binder, as well as motivation to work harder when compared to other participants. The

young adults were asked for comprehension of the group poster and the personal tracking chart.

The physical activity portion focused on muscle strength, endurance, and flexibility as well as aerobic activity. The initial intensity level was individualized by fitness level and follows guidelines established by the American College of Sports Medicine and the Surgeon General's Report on Physical Activity and Health (32). Activities included low impact aerobics and stationary pin-machines. The subjects were monitored by the research team.

Statistical Methods, Data Analysis and Interpretation

The Statistical Package for the Social Sciences (version 18, 2009 SPSS Inc, Chicago, IL) was used to conduct data analyses. Means and frequencies were computed as descriptive statistics for instrument subscale scores, survey item responses, anthropometric measures, and weight loss data. The chi-square statistic was used to test for baseline differences in categorical variables, such as demographics. An independent *t*-test evaluated the differences between intervention and control survey scores. Significance of change between the initial and postintervention results was assessed for both cohorts independent of each other. The paired samples *t*-test was used to analyze differences between pre/post nutrition knowledge survey results. Comparisons between the intervention and controls group for end of study scores were performed using analysis of covariance, where the covariate was the beginning value, and an independent samples *t*-test. The McNemar test was employed to assess significance of change for individual survey items. Pearson and Spearman correlation coefficients were used to test

associations between the NAKS survey, Nutrition Outcomes Expectations, and anthropometric data. For all analyses, the level of significance was set at $p < 0.10$ due to the small sample size.

RESULTS

Results from the pilot intervention indicated that there was no increase in nutrition knowledge and attitudes or decrease in barriers toward healthful eating. In addition, the difference in total survey scores from pre- to postintervention did not correlate with weight loss over the period of the study. However, the data suggested an increase in the support scale for the intervention group, as compared to the controls. Furthermore, the young adults in the intervention also showed a higher score in positive attitudes toward nutrition versus the controls at postintervention (93.2% compared to 60%, respectively). Overall, 22 participants completed the 12-week intervention from the enrolled sample (n=23), yielding a completion rate of 96%. Data from this subject were not analyzed due to lack of participation in the weekly classes.

Baseline demographics, family eating habits, and weight status are presented in Tables 1-4. The mean ages of the young adults enrolled in the study were 23.6 $\pm$ 3.1 years and 25.5 $\pm$ 4.8 years for the intervention and control groups, respectively. The sexes were approximately equal in representation in both groups (64% female in the intervention and 55% female in the control). The majority of the young adults were white (91% and 73%), with the remaining sample identified as American Indian/Alaska Native (9% and 9%), as reported by intervention and control participants, respectively. In the intervention group, 9% identified themselves as Hispanic or Latino, compared to

Table 1. Baseline characteristics of intervention and control subjects enrolled in a pilot study evaluating nutrition knowledge and behaviors in young adults with intellectual disabilities (n=22)

Domain[ab]	**Intervention (n=11)**		**Control (n=11)**	
	n	**&**	**n**	**%**
Diagnosis				
Down Syndrome	8	73	5	45
Autistic	0	0	2	18
Antisocial personality	0	0	1	9
Other ID	1	9	1	9
No Diagnosis	2	18	2	18
Gender				
Female	7	64	6	55
Male	4	36	5	45
Race				
White	10	91	8	73
American Indian/ Alaska Native	1	9	1	9
Not Reported	0	0	2	18
Ethnicity				
Hispanic or Latino	1	9	5	45
Not Hispanic/Latino	10	91	3	27
Unknown/ Not Reported	0	0	3	27
Highest Educational Level				
9th grade	0	0	1	9
12th grade	6	55	4	36
Some College	4	36	2	18
Not Reported	1	9	4	36
Is the Young Adult Working Now?				
No	6	55	3	27
Yes	5	45	4	36
Not Reported	0	0	4	36
Who Does the Young Adult Live With?				
Parents	11	10	8	73
Other	0	0	1	9
Not Reported	0	0	2	18

[a]Differences between groups were assessed using Chi-square analysis
[b]No significant differences exist between groups

Table 2. Baseline characteristics for the parents of subjects involved in a pilot study evaluating nutrition knowledge and behaviors in young adults with intellectual disabilities (n=22)

Domain[ab]	Intervention (n=11)		Control (n=11)	
	n	%	n	%
Marital Status				
Married	10	91	7	64
Divorced	1	9	2	18
Other	0	0	2	18
Is the Young Adult Adopted or a Natural Child?	10	91	10	91
Natural	0	0	1	9
Foster	1	9	0	0
Adopted				
How Many Kids Live At Home?	1	9	0	0
0	7	64	7	64
1-2	3	27	3	27
3-5	0	0	1	9
Not Reported				
Is Parent Employed?				
Yes	5	45	8	73
No-Retired	3	27	0	0
No-Fulltime Homemaker	3	27	0	0
Other	0	0	3	27
Highest Level of Education of Parents (Both Parents)				
High School Grad	3	14	4	18
Partial College	7	32	4	18
Standard College/ University Graduation	6	27	7	32
Graduate/ Professional Training	5	23	2	9
Not reported	1	5	5	23
Approximate Annual Family Income				
$15,001-$45,000	1	9	2	18
$45,001-$75,000	3	27	6	55
$75,001-$105,000	5	45	0	0
$105,001-$150,000	2	18	1	9

[a]Differences between groups were assessed using Chi-square analysis
[b]No significant differences exist between groups

Table 3. Baseline characteristics of eating habits for the families enrolled in a pilot study evaluating nutrition knowledge and behaviors in young adults with intellectual disabilities (n=22)

Domain[ab]	Intervention (n=11)		Control (n=11)	
	n	%	n	%
How Many Times/Week Watch TV While Eating?				
0	4	36	3	27
Sometimes	2	18	2	18
1/week	1	9	1	9
2-3/week	2	18	3	27
4-5/week	2	18	1	9
Not Reported	0	0	1	9
How Many Meals are Prepackaged?				
All	0	0	0	0
Most	1	9	0	0
Some	8	73	9	82
None	2	18	1	9
Not Reported	0	0	1	9
How Many Meals do you Eat Out at a Fast Food Restaurant per Week?				
0	0	0	0	0
1-2	5	45	5	45
3-5	4	36	4	36
6-8	2	18	1	9
Not Reported	0	0	1	9
How Many Meals are Made from Scratch?				
All	1	9	1	9
Most	7	64	6	55
Some	3	27	3	27
None	0	0	0	0
Not Reported	0	0	1	9

[a]Differences between groups were assessed using Chi-square analysis
[b]No significant differences exist between groups

Table 4. Baseline anthropometric variables for the intervention and control groups in a pilot study evaluating nutrition knowledge and behaviors in young adults with intellectual disabilities (n=22)

Domain[ab]	**Intervention (n=11)**	**Control (n=11)**
Weight (lbs)	203.8 ± 51.4	212.9 ± 35.0
BMI (kg/m²)	37.8 ± 7.1	37.6 ± 5.1
Waist Circumference (in)	41.4 ± 5.7	45.2 ± 6.4
Hip Circumference (in)	48.8 ± 6.8	50.5 ± 5.1

[a]Differences between groups were assessed using an independent samples *t*-test
[b]No significant differences exist between groups

45% in the control group, with non-Hispanic/Latino and unknown corresponding to the remaining 91% and 55%. Young adults reported the last grade completed in school to be 9^{th} (0% and 9%), 12^{th} grade (55% and 36%), or some college (36% and 18%) for the intervention and control groups, respectively. Slightly less than half of the intervention group was working at the time of the study (45%), as compared to the controls (36%). Almost all of the young adults were living with a parent (100% in the intervention and 73% in the control) or another caregiver (0% and 9%, respectively). Overall, there were no significant differences in demographic characteristics between the intervention and control participants.

The average ages of the parents of the young adults involved in the study were 50.3 ± 15.1 years for the intervention and 56.8 ± 8.7 years for the controls (Table 2). The majority of parents with children in the study were married (91% of intervention and 64% of control) and had at least one child living at home (91% and 100% respectively). The participants in the study were natural children for 91% of both groups, with one foster child in the control group, and one adopted in the intervention group. The parents for the intervention group reported a lower employment rate, with 45% compared to 73% of the control group. Eighty-six percent of parents of intervention participants and 82% of control participants continued school post high school. The most frequent annual income for the intervention group was $75,001-$105,000 (45%) compared to the control group who most frequently reported $45,001-$75,000 (55%). There were no significant differences between the groups for parent demographic data.

In addition, there were no significant differences in the eating habits of the family (Table 3). The majority of both groups ate some prepackaged food (73% for intervention

and 82% for control) and most had meals made from scratch (64% for intervention and 55% for control). Table 3 provides further details on the responses to the family eating habits survey.

The mean body weights at baseline were 203.8±51.4 lbs for the intervention and 212.9±35.0 lbs for the control, with average BMIs of 37.8±7.1 kg/m² and 37.6±5.1 kg/m², respectively (Table 4). The average waist circumference of the intervention group was 41.4±5.7 inches with an average hip circumference of 48.8±6.8 inches compared to 45.2±6.4 inches and 50.5±5.1 inches for the control group. There were no significant differences in anthropometric data between the two groups at baseline.

At baseline, total scores for the NAKS survey were 69.4% for the intervention and 79.4% for the control (Table 5). The intervention subjects scored highest on the attitudes survey (89.1%), with lower scores on the support (25.6%) and total NOE survey questions (62.8%). Subscale scores for the control subjects did not differ statistically from the subscale scores of the intervention subjects; thus, the controls provided a good comparison for the intervention.

Upon program completion, participants from the intervention group showed a significant increase in the support subscale. Mean scores rose from 4.1±1.8 to 6.1±2.1 ($p<0.05$) for the intervention group (Table 5). There was a greater increase in this subscale within the control group; however, the larger standard deviation contributed to the lack of significance (3.9 ± 3.8 to 6.1 ± 3.4). Improvement in scores was observed in the intervention group for the following subscales: NAKS survey (69.4% to 77.2%), attitudes questionnaire (89.1% to 93.2%), barriers questionnaire (65.4% to 66.8%) and

Table 5. Test-retest comparison of nutrition knowledge and behavior scores for the control and intervention participants (n=22) after a healthy lifestyles intervention

		Intervention (n=11)		Control (n=11)	
Domain	Possible Score	Mean Score ± SD[ab]	%	Mean Score ± SD	%
Initial Test					
NAKS	18	12.5 ± 3.7	69.4	14.3 ± 4.0	79.4
NOE:					
Attitudes	20	17.8 ± 2.0	89.1	14.3 ± 6.3[g]	71.3
Barriers	26	17 ± 5.0	65.4	14.4 ± 4.9[g]	55.3
Supports	16	4.1 ± 1.8[c]	25.6	3.9 ± 3.8[g]	24.4
Total Sum	62	38.9 ± 7.2	62.8	34 ± 7.2[g]	54.8
Post-Test					
NAKS	18	13.9 ± 3.7[e]	77.2	14.2 ± 4.6[f]	78.9
NOE:					
Attitudes	20	18.6 ± 2.8[d]	93.2	12.0 ± 7.7[d]	60.0
Barriers	26	17.4 ± 3.2	66.8	17.1 ± 4.6	65.9
Supports	16	6.1 ± 2.1[c]	38.1	6.1 ± 3.4	38.1
Total Sum	62	42.1 ± 2.6	67.9	35.1 ± 11.8	56.7

[a]SD_standard deviation.
[b]Analyses within a column determined by paired samples *t* tests, with those within a row evaluated by independent samples *t* tests.
[c]Common superscripts within a column indicate p-value <0.05
[d]Common superscripts within a row indicate p-value <0.10
[e]Surveys where n=10
[f]Surveys where n=10
[g]Surveys where n=8

total sum of NOE survey (62.8% to 67.9%); however, these increases were not statistically significant (Table 5). The higher scores for control participants were notstatistically significant and only found in the barriers score (55.3% to 65.9%), total sum of NOE survey (54.8% to 56.7%), and the aforementioned support subscale.

The attitudes subscale of the NOE survey showed significant differences at postintervention between the intervention and control groups, 93.2% and 60%, respectively ($p<0.10$) (Table 5). The significance may be due in part to the 34% increase in scores among intervention participants, in contrast to the 24% decrease from baseline among controls. All other comparisons of postintervention scores were found to be not significant (Table 5).

When scores of individual survey items were assessed, there was a significant change in four of the survey questions for both groups. One question found in the NAKS survey assessing an appropriate breakfast before physical activity showed a 50% increase from baseline ($p<0.10$). Two questions in the support subscale that inquired who helped the participants abstain from junk food showed a significant increase in the doctor/nurse and staff responses ($p<0.05$). One question in the same subscale asking the young adult who reminded them to eat more fruits and vegetables showed a significant rise in the doctor/nurse response ($p<0.10$).

Comparisons of weight loss achieved over the study and survey scores are documented in Table 6. Neither the NAKS survey nor the NOE survey responses were significantly correlated with weight loss during the study period for the intervention group ($p>0.10$), with similar findings in the control group ($p>0.10$).

Table 6. Correlation between nutrition surveys and weight loss

	Intervention		**Control**	
Domain	**Pearson's Correlation**	**Significance**	**Pearson's Correlation**	**Significance**
NAKS and Weight Loss	0.250	0.486	0.495	0.146
Comprehensive NOE and Weight Loss	0.119	0.727	0.231	0.582

Weight loss trackers were initially employed to gauge the effectiveness of this tool in motivating the participants for weight loss. Each participant (n=17) was asked his or her opinion about each type of tracker and if it was helpful. All the participants enjoyed the tracker in their binder and found it useful. All but four of the participants felt the same about the weight loss graph on the wall. The four who did not said it was either not at all or slightly helpful. The last question asked which one of the graphs was preferred. Two participants favored both equally, seven enjoyed the graph on the wall more, and eight preferred the personal binder trackers. One participant who liked the wall graph stated that he preferred it because all his friends were on there with him. The reasons the individual tracker was chosen were: it felt more personal and private, the wall graph was confusing, and the participant did not like competing against the others.

DISCUSSION

Overall, the 12-week lifestyle intervention did not significantly increase the participant nutrition knowledge or attitudes, as compared to the control population. The results from the NAKS survey showed that the scores for the intervention group did not increase from baseline, and were not significantly different from the control group. This would suggest that the program was not effective at imparting nutrition knowledge to the participants. The nonsignificance of the comprehensive NOE survey, and most of its subscales, indicated that the intervention did not create more positive attitudes toward fruit and vegetable intake, or reduce barriers compared to the control group. Finally, the low correlation coefficients showed that an increase in nutrition knowledge or positive attitudes was not associated with weight loss.

For both the NAKS and NOE questionnaires, there may be a question of whether the surveys were an appropriate tool for assessment. A previous study used for validation of the NAKS found that unless clarification was given for certain questions considered too complex for the population, the question was incorrectly answered (17), a problem that may have translated into this study.

For the intervention group, the lack of significant increase in nutrition knowledge among the obese participants may also be explained by data found in an article by Melville and colleagues (2). The results state that intellectually disabled participants with obesity demonstrate greater nutrition knowledge than nonobese participants. This

suggests that in people with ID, that nutrition knowledge education may not be the most effective component of a nutritional intervention. For example, Rotatori and colleagues reported that techniques such as self-monitoring of daily weight and food intakes, increasing awareness of environmental events related to eating, and reducing rate of eating and amount eaten were integral to the success of a weight loss program for this population (35). Therefore, a focus on behavioral changes may be more effective than solely nutrition education, not only for weight loss, but for nutrition behavior and attitude enhancements as well.

However, the results from the support subscale of the NOE show that the intervention group did increase their social support for a healthy lifestyle. This improvement may have resulted from the extra support provided by the staff of the project or new friends made during the program. This finding is significant as research has shown that lack of social support is a barrier for adopting a healthy lifestyle in this population (20). Furthermore, the study implemented additional tools for motivation, including monitoring progress, conducting the intervention in a community environment, giving positive reinforcement, and involving the participants in decision making which are important strategies for program implementation in the ID community (20, 25).

There is a lack of research with this population, especially related to nutrition education. Previous studies have focused only on physical activity and related barriers (14, 19-20, 25). Other research that found significant results in health education programs only used weight loss as an outcome, not a change in knowledge or attitudes (35-36). This study, however, included physical activity programming, as well as nutrition and health education.

Several weaknesses to this study may have contributed to the lack of significant results. First, the young adults completed the surveys by themselves. Having a staff member or parent assist other than for clarification could have altered participant responses; however, many of the young adults did not seem to understand the questions. For example, some answered the nutrition knowledge surveys circling the items that were most appealing and desirable, not necessarily what the question was asking. The surveys were previously tested and validated; yet may not be the most appropriate method to assess knowledge in this population. Second, the inclusion criteria in this study in reference to the level of intellectual disability of the young adult included both mild and moderate levels of ID; therefore, the participants varied in their levels of comprehension of the curriculum. Third, the small number of young adults in the study was a problem compounded with five missing surveys. The missing data reduced the sample size for statistical analysis and created difficulty in detecting significance with so few surveys.

Despite the lack of significant results, there were successes for study participants. The overall goal of the Yes We Can! intervention was to educate this population in healthy lifestyle behavioral changes for nutrition and physical activity. The survey results may not have shown an increase in nutrition knowledge or development of a more positive attitude toward fruits and vegetables; however, evidence from the trackers illustrates some success with weight loss. In addition, the participants became more physically active and developed friendships within the group that can be a source of social support.

The participants also reported that the weight loss graphs created specifically for this project were helpful visuals. Slightly more than half of the young adults preferred

the personal trackers in their binder; yet, most found both to be helpful tools. In the future, this type of graph may be an important program component to provide visual goals for the participants. One study by Kruger and colleagues showed that those who track variables such as fat and energy intake are more successful in weight loss and maintenance (33). In addition, the National Weight Control Registry reports that members who have sustained weight loss weigh themselves frequently and self-monitor weight loss (34). The principle of tracking progress in weight loss might have similar results in this population. One example from this study was a young man who noticed his weight loss trajectory was not increasing like the others and wanted to understand why. An investigator and research assistant talked to him about making changes like switching from regular soda to diet soda or water. A week or two later he noticed his trajectory was increasing and explained the results were due to the changes he made that were discussed during class.

The goal of this intervention was to create a comprehensive program that would educate participants in multiple components of a healthy lifestyle, remove barriers, and build new social supports, the combination of which had not been reported in previous research. The data show that the pilot study was unable to increase nutrition knowledge and create positive attitudes towards fruits and vegetables; however, the participants in the intervention found those additional support systems needed for behavioral changes.

CONCLUSION

The Yes We Can! intervention implemented a health education curriculum with physical activity programming to address the high prevalence of obesity in the ID population. Unfortunately, the program was unable to promote significant increases in nutritional knowledge and positive attitudes and behaviors for the participants. The study results confirm the difficulty of meeting the unique needs of the ID population through health programming to address nutrition, exercise and obesity prevention and treatment. Future research that elucidates appropriate nutrition assessment tools, monitoring strategies and educational curriculum for the ID population is urgently needed.

APPENDIX A

NAKS SURVEY

Adapted from the Exercise and Nutrition Health Education Curriculum for Adults with Developmental Disabilities

(This scale has a corresponding book with pictures for each item)

1. Which activity needs the most energy?	1	2	3	4
2. What burger do you think this man might have been eating?	1	2		
3. If you want to lose weight, you should?	1	2	3	4
4. Which is the healthiest breakfast?	1	2	3	
5. Which person do you think might lose the most weight?	1	2	3	4
6. This woman is going on a long walk with her dog. What breakfast should she eat?	1	2	3	
7. Which foods are best to keep our heart healthy?	1	2		
8. If you want to lose weight you should?	1	2	3	4

9. Which foods should you not have too often?	1	2	3	4
10. Which man will put on the most weight?	1	2	3	4
11. Which one of these foods has the most protein?	1	2	3	4
12. If you want to lose weight you should?	1	2	3	4
13. Which food has the most fat?	1	2	3	4
14. Which activity would help you lose the most weight?	1	2	3	4
15. Which group of foods has the most sugar?	1	2	3	4
16. Which activity needs the most energy?	1	2	3	4
17. Which group of foods would cause you to put on the most weight?	1	2	3	4
18. This man is going for a long walk. Which breakfast should he eat?	1	2	3	

APPENDIX B

NUTRITION OUTCOMES EXPECTATIONS SURVEY

Adapted from the Exercise and Nutrition Health Education Curriculum for Adults with Developmental Disabilities

We would like to know the reasons you would eat healthy. For each of these reasons, please tell us if you agree or disagree.

If you eat FRUITS and VEGETABLES every day, it would…

1. Help you lose or control your weight.

    - ☐ 1. Yes, it would help me lose/control my weight
    - ☐ 2. No, it would not help me lose/control my weight
    - ☐ 3. It would do both…I could both lose and gain weight
    - ☐ 4. I do not know what it would do

2. Give you more energy.

    - ☐ 1. Yes, it would give me more energy
    - ☐ 2. No, it would not give me more energy
    - ☐ 3. It would do both…I could have both more and less energy
    - ☐ 4. I do not know what it would do

3. Make your body feel good

    - ☐ 1. Yes, it would make my body feel good
    - ☐ 2. No, it would not make my body feel good
    - ☐ 3. It would do both…make my body feel good and not so good
    - ☐ 4. I do not know what it would do

4. Make you feel stronger

    - ☐ 1. Yes, it would make me feel stronger
    - ☐ 2. No, it would not make me feel stronger
    - ☐ 3. It would do both…make me feel stronger and not so strong
    - ☐ 4. I do not know what it would do

5. Help you get in shape

    - ☐ 1. Yes, it would help me get in shape
    - ☐ 2. No, it would not help me get in shape
    - ☐ 3. It would do both…help me get in shape and not get in shape
    - ☐ 4. I do not know what it would do

6. Help you look better

    - ☐ 1. Yes, it would help me look better
    - ☐ 2. No, it would not help me look better
    - ☐ 3. It would do both...help me look better and not look better
    - ☐ 4. I do not know what it would do

7. Improve your health

    - ☐ 1. Yes, it would improve my health
    - ☐ 2. No, it would not improve my health
    - ☐ 3. It would do both…help me improve and not improve my health
    - ☐ 4. I do not know what it would do

8. Improve your cholesterol level

    - ☐ 1. Yes, it would improve my cholesterol level
    - ☐ 2. No, it would not improve my cholesterol level
    - ☐ 3. It would do both…improve and not improve my cholesterol level
    - ☐ 4. I do not know what it would do

9. Improve your blood pressure

    - ☐ 1. Yes, it would improve my blood pressure
    - ☐ 2. No, it would not improve my blood pressure
    - ☐ 3. It would do both…improve and not improve my blood pressure
    - ☐ 4. I do not know what it would do

10. Help you be healthier

- ☐ 1. Yes, it would help me be healthier
- ☐ 2. No, it would not help me be healthier
- ☐ 3. It would do both…help me and not help me be healthier
- ☐ 4. I do not know what it would do

Barriers to Nutrition

We would like to know the reasons that may keep you from eating fruits and vegetables. Please answer if you agree or disagree with these reasons.

1. Do you help to cook at home?

   - ☐ 1. Yes
   - ☐ 2. No

2. Do you help to do the grocery shopping?

   - ☐ 1. Yes
   - ☐ 2. No

3. Fruits and vegetables cost too much money

   - ☐ 1. They cost too much money
   - ☐ 2. They do not cost too much money
   - ☐ 3. Both…they cost and do not cost too much money
   - ☐ 4. I do not know if they cost too much money

4. You and your family don't have enough time to cook fruits and vegetables

   - ☐ 1. My family and I do not have enough time to cook fruits and vegetables
   - ☐ 2. My family and I do have enough time to cook fruits and vegetables
   - ☐ 3. My family and I sometimes have enough time, and sometimes not
   - ☐ 4. I do not know if we have enough time to cook fruits and vegetables

5. Fruits and vegetables will not make you healthier

   - ☐ 1. They will not make me healthier
   - ☐ 2. They will make me healthier
   - ☐ 3. Sometimes not make me healthier, sometimes will
   - ☐ 4. I do not know if they will make me healthier

6. Fruits and vegetables will make you sick

    - ☐ 1. They will make me sick
    - ☐ 2. They will not make me sick
    - ☐ 3. Sometimes they will make me sick
    - ☐ 4. I do not know if they will make me sick

7. Eating fruits and vegetables is too hard

    - ☐ 1. It is too hard
    - ☐ 2. It is not too hard
    - ☐ 3. It is both hard and not hard
    - ☐ 4. I do not know if it is too hard

8. Fruits and vegetables are too hard to swallow/chew

    - ☐ 1. They are too hard to swallow/chew
    - ☐ 2. They are not too hard to swallow/chew
    - ☐ 3. They are both hard and not too hard to swallow/chew
    - ☐ 4. I do not know if they are too hard to swallow/chew

9. You don't know how to cook fruits and vegetables

    - ☐ 1. I do not know how to cook fruits and vegetables
    - ☐ 2. I do know how to cook fruits and vegetables
    - ☐ 3. I do and do not know how to cook fruits and vegetables
    - ☐ 4. I don't know if I do or don't

10. You are too lazy to make food with fruits and vegetables

    - ☐ 1. I am too lazy
    - ☐ 2. I am not too lazy
    - ☐ 3. Sometimes I am too lazy
    - ☐ 4. I do not know if I am too lazy

11. No one will show you how to make food with fruits and vegetables

    - ☐ 1. No one will show me
    - ☐ 2. Someone will show me
    - ☐ 3. Sometimes someone will show me
    - ☐ 4. I do not know if someone will show me

12. Fruits and vegetables go bad too fast

- ☐ 1. They go bad too fast
- ☐ 2. They do not go bad too fast
- ☐ 3. Sometimes they go bad too fast
- ☐ 4. I do not know if they go bad too fast

13. Fruits and vegetables do not taste good

- ☐ 1. They do not taste good
- ☐ 2. They do taste good
- ☐ 3. Sometimes they taste good, sometimes not
- ☐ 4. I do not know if they taste good

Social/Environment Supports for Nutrition

Now we will ask you about things that might help you make healthy food choices. (First ask if anyone provides the following supports then probe who.)

Does anyone you know: (Circle all that apply)	No One	Family	Friends	Doctor/ Nurse	Staff
1. Tell you not to eat "junk foods" such as candy, cake, and chips?	1	2	3	4	5
2. Remind you to eat more fruits and vegetables?	1	2	3	4	5
3. Compliment you on trying to eat healthier ("Good job," "Keep it up," "We are proud of you.")	1	2	3	4	5
4. Give you fruits and vegetables as a snack during the day?	1	2	3	4	5

APPENDIX C

EVALUATION OF WEIGHT LOSS TRACKER

Yes We Can! Weight Loss Tracker Questionnaire
1. Did you like the group weight loss tracker on the wall?
2. Did you find it helpful?
3. Did you like having the individual tracker in your binder to look at?
4. Did you find it helpful?
5. Which one did you think helped you the most?

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